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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In the Application of:

Robert H. Moffett

CASE NO.: CH2814 US NA

SERIAL NO.: 09/898,437

GROUP ART UNIT: 1724

FILED: 07/03/2001

EXAMINER: Peter Hruskoci

FOR: Phosphorus Reduction in Aqueous Streams

APPELLANT'S APPEAL BRIEF

Assistant Commissioner for Patents
Washington, DC 20231

Sir:

Appellant submits this appeal brief and request the Board to reverse the Examiner's final rejection of claims 1-40.

REAL PARTY IN INTEREST

E.I. du Pont de Nemours and Company, assignee of the application, is the real party in interest.

RELATED APPEALS AND INTERFERENCES

An appeal brief was submitted October 2, 2002 for application 10/013,406 ('406 application). The '406 application is directed to a process comprising contacting a substantially aqueous stream, which comprises biosolids, with an effective amount of (a) an anionic inorganic colloid and (b) an organic polymer to produce flocculated biosolids; and optionally (c) separating said flocculated biosolids from the stream. Appellant's Appeal Brief for the '406 application is incorporated herein by reference.

STATUS OF CLAIMS

Forty claims were originally submitted for examination. During the prosecution, some claims were amended. All claims were finally rejected. The appealed claims are claims 1-40, which are presented in the APPENDIX.

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STATUS OF AMENDMENTS

A first amendment amending, among others, claims 1 and 32 by narrowing the scope of inorganic colloid to "silica-based" inorganic colloid and was deemed to raise new issue and was not entered. Appellant submitted a second amendment without narrowing the scope of inorganic colloid. The second amendment would be entered upon the filing of an appeal. No claims were allowed.

SUMMARY OF THE INVENTION

The claimed invention is directed to a process that can be used for reducing phosphorus content in a substantially aqueous stream. The process comprises comprising (a) adjusting pH of the stream to a pH of at least 7 with a calcium-containing compound; (b) adding zinc and/or manganese metal ions to the stream; (c) adding an anionic inorganic colloid to the stream; and (d) adding an organic polymer to produce a flocculated mass (claim 1); or (c) adding at least one cationic organic polymer to the stream; and (d) adding at least one anionic organic polymer to the stream to produce a flocculated mass (claim 5). Elements (c) and (d) are required in the claimed process.

REFERENCES

1. Allgulin (US 4,566,975; January 28, 1986);
2. Chung et al (US 5,597,490; January 28, 1997);
3. Laurent et al (US 5,269,939; December 14, 1993);
4. Ayukawa (US 4,097,377; June 27, 1978); and
5. Monick et al (US 4,765,908; August 23, 1988).

ISSUES

1. Was the Examiner correct in rejecting claims 1, 3-5, 7-14, and 23-24 under 35 USC §103(a) over Allgulin and Chung et al?
2. Was the examiner correct in rejecting claims 2-4, 6-14, and 25-33 under 35 USC §103(a) over Allgulin, Chung et al, and Laurent et al?

3. Was the Examiner correct in rejecting claims 15-16, 19, 22-24, and 34 under 35 USC 103(a) over Ayukawa and Monick et al?

4. Was the Examiner correct in rejecting claims 17-18, 20-22, and 35-40 under 35 USC 103(a) over Ayukawa, Monick et al, and Laurent et al?

GROUPING OF CLAIMS

For issue 1, all claims shall stand and fall together.

For issue 2, claims 2-4 and 6-14 stand and fall together as a group. Claims 25-33, by reciting "consisting essentially of", are patentably distinct from claims 2-4 and 6-14. Claims 25-33 shall be additionally argued as shown below and shall stand and fall together as a group.

For issue 3, claims 15-16, 19, and 22-24 shall stand and fall together. Similar to issue 2, claim 34, by reciting "consisting essentially of", is patentably distinct from claims 15-16, 19, and 22-24 and shall be further individually argued as shown below.

For issue 4, claims 17-18 and 20-22 shall stand and fall together. Again, claims 35-40, reciting "consisting essentially of", are deemed patentably distinct from claims 17-18 and 20-22, shall be separately argued and stand and fall as a group.

ARGUMENTS

1. Whether the Examiner Erred in Rejecting Claims 1, 3-5, 7-14, and 23-24 under 35 USC §103(a) Over Allgulin in View of Chung et al.

A. The Invention

Claims 1 and 5 recite

1. A process to remove phosphorus from an aqueous stream, which comprises phosphorus, comprising: (a) adjusting pH of the stream to a pH of at least 7 by adding a calcium-containing compound; (b) adding one or more metal ions selected from the group consisting of zinc and manganese ions to the stream wherein the metal ion is present in the range of from about 0.01 to about 10,000 ppm, based on weight of the stream; (c) adding an anionic inorganic colloid to the stream; and (d) adding an organic polymer at about 0.01 to about 10,000 ppm, based on weight of the stream, to produce a flocculated mass.

5. A process to remove phosphorus from an aqueous stream, which comprises phosphorus, comprising (a) adjusting pH of the stream to a pH of

at least 7 by adding a calcium containing compound; (b) adding one or more metal ions selected from the group consisting of zinc ions and manganese ions to the stream wherein the metal ion is present in the range of from about 0.01 to about 10,000 ppm, based on weight of the stream; (c) adding at least one cationic organic polymer to the stream; and (d) adding at least one anionic organic polymer to the stream to produce a flocculated mass.

B. Preamble

The preamble recites a process to remove phosphorus from an aqueous stream, which comprises phosphorus. The term "stream" is repeatedly recited in the body of the claims. Therefore, appellant intends that the preamble be limiting by incorporating the term in the preamble into the body of the claims.

C. Allgulin Does Not Suggest the Claim Limitations

Allgulin does not disclose or suggest the following elements recited in the claims: (c) adding an anionic inorganic colloid to the stream; and (d) adding an organic polymer to produce a flocculated mass (claim 1); or (c) adding at least one cationic organic polymer to the stream; and (d) adding at least one anionic organic polymer to the stream to produce a flocculated mass (claim 5).

That is, Allgulin does not disclose or suggest most of the limitations called for in the claims. Appellant sees no reason to rely on Allgulin for a 103(a) rejection.

D. Allgulin Teaches Away from the Claimed Invention

Allgulin discloses (column 2, line 42, *et seq.*) that . . . a very large percentage of mercury and other heavy metals present in the aqueous solution could also be precipitated out at the same time as the arsenic and phosphorous[sic]. . . . , *provided* that there is chosen a precipitation reagent which causes not-readily dissolved hydroxides to form in the solution (*italics* appellant's).

Allgulin also discloses, column 3, line 6, *et seq.*, that . . . the impurities in question are precipitated . . . , there is formed in the aqueous solution a hydroxide precipitate which contains the impurities and which can be substantially completely separated from the solution.

Allgulin further discloses in column 3, lines 10-13, that there is formed in the aqueous solution a hydroxide precipitate which contains the impurities and which can be substantially completely separated from the solution.

It can be seen that Allgulin repeatedly discloses and suggests that, to precipitate phosphorus, the precipitant must cause not-readily dissolved hydroxides to form in the solution. It can also be seen that Allgulin not only discloses, but also suggests that once metal ions are added to the solution, a *complete precipitate* of the impurities including phosphorus is formed and separated.

The apparent teaching of Allgulin is that addition of a metal ion such as Zn or Mn causes complete precipitation. The additional teaching of Allgulin is that, because a complete precipitate has already been formed (i.e., there is nothing else to be precipitated), there should be added no additional material, such as (1) an inorganic anionic colloid and organic polymer or (2) a cationic polymer and anionic polymer recited in the claimed invention, for precipitating phosphorus.

As such, Allgulin expressly leads one skilled in the art away from the claimed invention which, following the addition of Zn and/or Mn ions, requires an inorganic anionic colloid and organic polymer, or a cationic polymer and an anionic polymer, to precipitate the phosphorus.

E. Chung et al is a Non-analogous Art

To be analogous art, the reference must either be in the appellants' endeavor or, if not, be reasonably pertinent to the particular problem with which appellant was concerned. See, e.g., *In re Clay*, 966 F.2d 656, 23 USPQ2d 1058 (Fed. Cir. 1992).

In *Clay*, a two-prong test to determine whether prior art is analogous was discussed: (1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of inventor's endeavor, whether the reference is reasonably pertinent to the particular problem with which the inventor is involved.

There, the Board argued that Sydansk and Clay's inventions are part of a common endeavor in maximizing withdrawal of petroleum from reservoir. The

Federal Circuit disagreed because Sydanski cannot be considered to be within Clay's field of endeavor merely because both relate to the petroleum industry.

The first question is whether Chung et al is related to appellant's endeavor.

Chung et al discloses treatment of food processing wastes by a chemical treatment method that effectively removes fat, blood, tissue and other solids from food processing waste, using novel hydrophobical silicon-containing copolymer compositions (Abstract and column 2, lines 35-44; hereinafter referred to as "coagulant") (Column 5, line 3, "[t]he silicon containing *coagulants* of the present invention"; Column 2, lines 48-52, [a] method for conditioning food processing waste . . . with an effective amount of at least one silicon containing polymer *coagulant*).

However, from the four corners of Chung et al disclosure, appellant sees no disclosure or suggestion that the process disclosed in Chung et al can be used for removing phosphorus from an aqueous stream.

It is submitted that removing phosphorus (such as phosphorus in fertilizer) and removing fat, blood, and tissue, all of which being or containing complex biological polymers are ostensibly not the same or even similar. If the prior art and the rejected claims in *Clay*, both relate to the petroleum industry, are not deemed the same field of endeavor, removing phosphorus and chemical treatment removing fat, blood, tissue and other solids must not be in the same field of endeavor. Applying the two-prong test of *In Clay*, one can readily discern that Chung et al and the claimed invention are not within the same field of endeavor.

The next question is whether Chung et al is reasonably pertinent to the particular problem with which appellant was concerned.

As disclosed on page 2 of the present application, the problems with which appellant was concerned are: there is a desire to recover phosphorus from waste stream for use as a nutrient; though use of iron and aluminum salts can be effective to form a flocculated mass to remove and recover phosphorus from waste stream, each of these creates issues for subsequent use of the recovered phosphorus-containing flocculated mass; when excess iron is present in a flocculated mass, the mass has an increased tendency to become rancid over short periods of time limiting

use as an additive in a fertilizer or potential animal feed; and aluminum is a neuro-toxin.

On the other hand, as disclosed in Chung et al, column 2, lines 16-27, the problems of concern in Chung et al are: the polymers in the art (i.e., those disclosed in column 1, line 55 to column 2, line 15 - dry polymers, latex polymers, polyethylene oxide, polyethylene amine, polydiallyldimethylammonium chloride, copolymers of acrylamide, quaternized acrylates, Poly(DADMAC), DADMAC/acrylamide copolymers, and hydrophobically modified DADMAC copolymers) have been traditionally synthesized in an oil solvent, thereby producing an environmentally unfriendly treatment program as well as presenting a potential fire hazard; chemical treatments incorporating these polymers contain surfactants; and these prior chemical treatments have a high toxicity thereby preventing the use of such treated waters for recycling purposes or for public drinking water supplies. Facing the problems of these polymers, Chung et al invented the silicon-containing polyelectrolyte polymer disclosed therein.

Comparing the problems of concern in Chung et al and the problems with which appellant was concerned, one can readily see that Chung et al is not pertinent to the problems with which appellant was concerned.

Accordingly, Chung et al does not meet the second prong of the two-prong test enunciated in *Clay* and, therefore, cannot be an analogous art and cannot be combined with Allgulin.

F. Chung et al Teaches Always from the Claimed Invention

As discussed above, the present application (page 2) discloses that, though use of iron and aluminum salts can be effective to form a flocculated mass to remove and recover phosphorus from waste stream, excess iron present in a flocculated mass increases tendency to become rancid over short periods of time limiting use of recovered mass as an additive in a fertilizer or potential animal feed and aluminum is a neuro-toxin.

Chung et al, however, expressly discloses that a second coagulant and a precipitant may also be added to the food processing wastewater in which the

second coagulant includes, among others, ferric sulfate, ferrous sulfate, aluminum sulfate, aluminum chloride, polyaluminum chloride, ferrous chloride, ferric chloride, aluminum chlorohydrate, . . . (column 5, lines 27-53). Chung et al discloses those aluminum-containing chemicals that are expressly discredited by appellant. It appears that Chung et al teaches away from appellant's invention.

G. Chung et al Does Not Disclose or Suggest Anionic Inorganic Colloid and Cationic Polyacrylamide

Chung et al discloses, column 2, lines 35-44, treatment of food processing wastes using silicon-containing polyelectrolyte copolymers ("coagulant") which are copolymers of diallyldimethyl ammonium halides (particularly diallyldimethyl ammonium chloride (DADMAC)) and vinyl alkoxysilanes (preferably vinyltrimethoxysilane (VTMS)).

The coagulant can be used alone or in combination with a high molecular weight anionic or non-ionic or amphoteric water soluble or dispersible flocculant (column 3, lines 57-62; *see also* column 4, lines 22-32).

However, Chung et al does not disclose or suggest that the flocculant disclosed therein can be used with an anionic inorganic colloid. Chung et al is discloses in column 4, lines 22-32 as follows.

The flocculant which may be used in this program may be anionic, non-ionic cationic **or** amphoteric. *Anionic* flocculants are exemplified by AcAm/sodium or ammonium (meth)acrylate copolymers, poly(sodium or ammonium (meth)acrylate), AcAm/sodium AMPS copolymers, homo or copolymers of vinylsulfonic acid, homo or copolymers of maleic acid. **Non-ionic** flocculants include, poly(meth)acrylamide, polyethylene oxide, *clays*, *bentonite*. Cationic flocculants include homo or copolymers of DMAEA or DMAEM quats with AcAm (*italics* and **bold**-type appellant's).

It is apparent that Chung et al does not disclose or suggest an anionic inorganic because Chung et al discloses nonionic clays or bentonite flocculant.

Even if the non-ionic clays or bentonite disclosed in Chung et al could be argued as anionic inorganic colloid, Chung et al does not suggest combining the anionic inorganic colloid and an organic polymer. Such combination is specifically called for in the claimed invention.

If Chung et al intends that the combinations of flocculants be used, it unequivocally so discloses using appropriate words such as "and combinations thereof" or "and mixtures thereof". For example, Chung et al discloses the following

As such vinyl trimethoxy, triethoxy, tripropoxy and tributoxysilanes, **and combinations thereof**, may find use in the subject invention. While vinyl trialkoxysilanes are preferred, the monomers may be mono or di-substituted as well, **or mixtures of** mono-, di- and tri-alkoxy substituted silanes may be used (column 2, line 64 to column 3, line 2).

Examples of suitable second coagulants that may be used in the present invention include: ferric sulfate, ferrous sulfate, aluminum sulfate, aluminum chloride, polyaluminum chloride, ferrous chloride, ferric chloride, aluminum chlorohydrate, colloidal silica, ethylene-dichloride/ammonia polymers, melamine/formaldehyde polymers, and epichlorohydrin-dimethylamine condensation polymer in liquid form; polydiallyldimethyl ammonium chloride in liquid or solid form; **and mixtures thereof** (column 5, lines 44-53) (*italics* and **bold-type** appellant's).

It is clear from this disclosure, Chung et al intends that one or more of these second coagulants can be combined. However, Chung et al in column 4 shown above does not disclose the words "and combinations thereof" or "and mixtures thereof". It is apparent that Chung et al compellingly suggests, by disclosing the word "or" (appellant highlighted above) and by not disclosing that any of these flocculants can be combined, that organic polymer and clays should not or cannot be combined.

Appellant cannot find in Chung et al any disclosure that the flocculant and second coagulant disclosed therein can be combined.

Appellant therefore concludes that there is no suggestion, in Chung et al disclosure, of (1) using an *anionic inorganic* colloid and (2) the combination of an organic polymer and an *anionic inorganic* colloid.

Chung et al also discloses that the food processing wastes are preferably treated with coagulants and optionally with flocculants (column 2, lines 53-54).

Chung et al further discloses that a second coagulant and a precipitant may also be added to the food processing wastewater in which the second coagulant includes: ferric sulfate, ferrous sulfate, aluminum sulfate, aluminum chloride, polyaluminum chloride, ferrous chloride, ferric chloride, aluminum chlorohydrate, colloidal silica, ethylene-dichloride/ammonia polymers, melamine/formaldehyde

polymers, and epichlorohydrin-dimethylamine condensation polymer in liquid form; polydiallyldimethyl ammonium chloride in liquid or solid form; and mixtures thereof (column 5, lines 27-53).

It is apparent that Chung et al does not disclose or suggest Zn or Mn ions to be added to aqueous stream.

Also, Chung et al, as discussed in the related appeal filed September 23, 2002 for '406 application, does not disclose cationic polyacrylamide. A cationic polyacrylamide is required in claims 7, 9, 11, and 13.

H. References Suggests Against Combination

Assuming, *arguendo*, Allgulin can be a reference for the 103(a) rejection, Chung et al can be analogous art and does not teach away from appellant's invention, and Chung et al suggests anionic inorganic colloid and cationic polyacrylamide, the question is whether there is suggestion in the references themselves for combining the disclosures of Allgulin and Chung et al.

As discussed in subsection D above, Allgulin not only discloses, but also suggests that once metal ions are added to the solution, a *complete precipitate* of the impurities including phosphorus is formed and separated. The apparent suggestion of the disclosure is that there is no need to add an anionic inorganic colloid and/or flocculant to precipitate the impurities because the impurities had already been precipitated. A further suggestion is that the colloidal silica, or flocculant, or both, should not be added because there is nothing else to be precipitated.

Accordingly Allgulin suggests that the Chung et al disclosure cannot or should not be combined with Allgulin. As such, appellant respectfully submits that the USPTO has not established a *prima facie* case of obviousness.

I. Combined References Do Not suggest the Claimed Invention

Further assuming Allgulin can be a reference for the 103(a) rejection and Chung et al can be analogous art, and Allgulin and Chung et al can be combined,

the question is whether Chung et al discloses or suggests the teaching or elements missing in Allgulin.

The question can also be framed as to whether combining Allgulin and Chung et al suggests, the combination of pH adjustment, addition of Zn or Mn ions to an aqueous stream, and either (1) an anionic inorganic colloid *and* an organic polymer (claim 1 and its dependent claims) or (2) at least one cationic organic polymer *and* at least one anionic organic polymer to the stream (claim 5 and its dependent claims).

Allgulin and Chung et al disclosures discussed above are incorporated here.

Also assuming that Allgulin and Chung et al disclose or suggest all elements recited in the claims, appellant still sees no suggestion for the combination of pH adjustment, addition of Zn or Mn ions to an aqueous stream, and either (1) an anionic inorganic colloid and an organic polymer or (2) at least one cationic organic polymer and at least one anionic organic polymer to the stream.

Accordingly, appellant submits that the USPTO has not established a *prima facie* case of obviousness.

J. The Application Demonstrates Unexpected Results

Even if the USPTO arguably established a *prima facie* case of obviousness, the *prima facie* case of obviousness can be readily rebutted by unexpected results shown in the application.

The Board is respectfully directed to appellant's declaration accompanying the response to the first Office Action (paper 5). There, it shows that addition of ZnCl_2 at an alkaline pH (final pH 9.7), similar to that disclosed in Allgulin, did not reduce the phosphorus (P) concentration or COD (runs 1 and 2).

Surprisingly or unexpectedly, after the addition of Zn ions and pH adjustment, addition of an anionic colloid and a polymer (run 3), as recited in the claimed invention, P concentration was reduced by almost 90% and COD was reduced by over 80%. The declaration demonstrates that addition of an anionic colloid and a polymer following the pH adjustment and Zn ions addition (run 3) as recited in the claimed invention, is required to significantly reduce the P concentration and COD. Such synergistic effect is not suggested in the references.

For the foregoing reasons, appellant submits that the examiner erred in rejecting claims 1, 3-5, 7-14, and 23-24 under 35 USC §103(a) over Allgulin and Chung et al and requests that the rejection be reversed.

2. Whether the Examiner Erred in Rejecting Claims 2-4, 6-14, and 25-33 under 35 USC 103(a) over Allgulin, Chung et al, and Laurent et al.

A. No Prima Facie Case of Obviousness Established

The argument in the first issue related to Allgulin and Chung et al discussed above is incorporated here. As discussed, combining Allgulin and Chung et al does not suggest claims 1, 3-5, 7-14, and 23-24. Claims 2-4 and 6-14 are dependent claims of claims 1 or 5 and are therefore unobvious over Allgulin and Chung et al.

The question is whether Laurent et al discloses or suggests the teaching or elements missing in Allgulin and Chung et al. The teaching or elements missing is the combination of pH adjustment, addition of Zn or Mn ions to an aqueous stream, and either (1) an anionic inorganic colloid and an organic polymer or (2) at least one cationic organic polymer and at least one anionic organic polymer to the stream.

Laurent et al discloses, as acknowledged by the examiner, recovery of contaminants from waste streams using natural flocculants and use the recovered flocculated waste for animal feed. However, Laurent et al does not cure the lack of suggestion in the combined Allgulin and Chung et al because appellant sees no suggestion in Laurent et al the combination of pH adjustment, addition of Zn or Mn ions to an aqueous stream, and either (1) an anionic inorganic colloid and an organic polymer or (2) at least one cationic organic polymer and at least one anionic organic polymer to the stream. Whether Laurent et al discloses the use of recovered waste is immaterial to the claimed invention.

B. Claims 25-33

Claim 25 recites a process consisting essentially of adjusting the pH of an aqueous stream, which comprises phosphorus, to at least 7; adding zinc ions and/or manganese ions; adding an anionic inorganic colloid; and either (a) adding an organic polymer to produce a flocculated mass; or (b) adding at least one cationic organic polymer and at least one anionic organic polymer to the stream to produce a

flocculated mass; or (c) adding an organic polymer at about 0.01 to about 10,000 ppm, based on weight of the stream, to produce a flocculated mass. Thereafter, the flocculated mass is recovered and used as a nutrient source.

First, the transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials or steps "and those that do not materially affect the basic and novel characteristic(s)" of the claimed invention. *In re Herz*, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976) (emphasis original).

In addition to the above-discussed, Allgulin discloses (column 3, lines 1-5):

The above mentioned surprising results when purifying water solutions are obtained when applying the method according to the invention, which is characterized by the procedural steps set forth in the accompanying claims.

The procedural steps set forth in the claims, claim 1 is representative, are quoted as follows.

- (a) supplying the aqueous solution and precipitating agent comprised of metal ions capable of forming a substantially insoluble hydroxide precipitate to a first precipitating stage wherein the aqueous solution and precipitating agent are mixed at a pH of at least 9 and a precipitate is formed;
- (b) separating at least a portion of the precipitate formed in the first precipitating stage containing a portion of the arsenic and/or phosphorus and impurity from the aqueous solution and removing said portion from the aqueous solution;
- (c) transferring the aqueous solution to a last precipitating stage;
- (d) adding precipitating agent comprised of metal ions capable of forming a substantially insoluble hydroxide precipitate to the aqueous solution in the last precipitating stage at a pH between about 8 and 9 whereby a precipitate is formed;
- (e) separating the precipitate formed in the last precipitating stage containing a further portion of the arsenic and/or phosphorus impurity from the aqueous solution wherein substantially purified aqueous solution is obtained;
- (f) recycling the precipitate from step (e) to step (a) such that the amount of metal ions in the precipitate is greater than the amount of metal ions supplied by the precipitating agent of step (a) wherein the amount of precipitating agent added to the last precipitating stage is selected such that the ratio of equivalents of precipitating agent to moles of arsenic and/or phosphorus and impurity in the last precipitating stage is at least 2:1 and wherein said ratio in the first precipitating stage is at least 0.8:1 and is less than said ratio in the last precipitating stage

Each of Allgulin and Chung et al discloses steps that would materially affect the basic and novel characteristics of claim 25 and its dependent claims. For example, in Allgulin, there are at least two steps for pH adjustments and formations of insoluble hydroxides. Also for example, Chung et al requires a step of treating a food processing waste with a silicon-containing polyelectrolyte coagulant. These steps are excluded from claims 25-33. Accordingly, claims 25-33 further distinguish over Allgulin, Chung et al and Laurent et al.

Secondly, Allgulin does not disclose or suggest either (a) an anionic inorganic colloid and adding an organic polymer to produce a flocculated mass; or (b) adding at least one cationic organic polymer and at least one anionic organic polymer to the stream to produce a flocculated mass; or (c) adding an organic polymer to produce a flocculated mass. Nor does Allgulin disclose or suggest recovering the flocculated mass for use as a nutrient source.

Chung et al does not disclose or suggest (1) adjusting the pH of an aqueous stream, which comprises phosphorus, to at least 7; (2) adding zinc ions and/or manganese ions; and (3) adding an anionic inorganic colloid (elements required in claim 25). Nor does Chung et al disclose or suggest that, thereafter, adding an organic polymer to produce a flocculated mass (claim 26); or adding at least one cationic organic polymer and at least one anionic organic polymer to the stream to produce a flocculated mass (claim 27); or adding an organic polymer at about 0.01 to about 10,000 ppm, based on weight of the stream, to produce a flocculated mass (claim 28).

Therefore, albeit they are not combinable, combining Allgulin and Chung et al apparently does not disclose or suggest, *following a pH adjustment and addition of Zn or Mn ions*, (a) adding an anionic inorganic colloid *and* adding an organic polymer; or (b) adding at least one cationic organic polymer and at least one anionic organic polymer; or (c) adding an organic polymer at about 0.01 to about 10,000 ppm to the stream to produce a flocculated mass.

The question is whether Laurent et al suggests that, *following a pH adjustment and addition of Zn or Mn ions*, (a) adding an anionic inorganic colloid *and* adding an organic polymer; or (b) adding at least one cationic organic polymer and at least one anionic organic polymer; or (c) adding an organic polymer at about 0.01 to

about 10,000 ppm to the stream to produce a flocculated mass. Appellant sees no such suggestion in Laurent et al.

As such, the examiner erred in rejecting claims 2-4, 6-14, and 25-33 under 35 USC 103(a) over Allgulin, Chung et al, and Laurent et al.

3. Whether the Examiner erred in Rejecting Claims 15-16, 19, 22-24, and 34 under 35 USC 103(a) over Ayukawa and Monick et al.

Claim 15 recites

15. A process to remove phosphorus from an aqueous stream, which comprises phosphorus, comprising (a) adding one or more metal ions selected from the group consisting of titanium and zirconium to the stream; and (b) adding an organic polymer at about 0.01 to about 10,000 ppm, based on weight of the stream, to the stream to produce a flocculated mass.

Claim 34 recites

34. A process to remove phosphorus from an aqueous stream, which comprises phosphorus, consisting essentially of adding one or more metal ions selected from the group consisting of titanium and zirconium, and a cationic organic polymer to the stream to the stream to produce a flocculated mass wherein the metal ion and said organic polymer is each present in the range of from about 1 to about 2,500 ppm, based on weight of the stream.

Claims 15-16, 19, and 22-24 therefore call for addition of an organic polymer and either Ti ions, or Zr ions, or both to a stream. Claim 34 has a narrower scope than that of claim 15 by using the transitional phrase "consisting essentially of".

The question is whether the references suggest the addition of an organic polymer and either Ti ions, or Zr ions, or both to a stream.

A. References Do Not Suggest the Invention and Are Against Combination

Ayukawa discloses purification of wastewater comprising coagulating and precipitating suspended substances and colloidal dispersed particles, and precipitating non-colloidal dissolved, low molecular weight, substances by adding an aqueous solution of $\text{ZrOCl}_2 \cdot 8\text{H}_2\text{O}$ to the wastewater, adjusting the pH to 4.5-6.8 to form water insoluble precipitates or chelates thereof and removing the precipitates

and chelates. See Abstract and where the examiner cited, especially column 3, lines 54-64.

Ayukawa disclosure, precipitating and flocculating a colloidal and non-colloidal substance by a zirconium salt, is therefore contrary to the claimed invention because the invention recites adding titanium ions or zirconium ions or both and an organic polymer to the stream (claim 15 and claims dependent therefrom), and further an anionic inorganic colloid (claim 22) to produce a flocculated mass.

Once the precipitates or chelates are formed by the addition of Zr ions as disclosed in Ayukawa, the question becomes whether it is logical to suggest the need of adding an organic polymer to the precipitates or chelates. Apparently, it is not.

That is, Ayukawa does not suggest the claimed invention.

The question is then whether Monick et al suggests that an organic polymer (claim 15) or combining an organic polymer and an inorganic colloid (claim 22) is needed to remove phosphorus.

Monick et al discloses a treatment composition for removing heavy metals from wastewater using activated montmorillonite; bentonite; one or more flocculants; an alkali metal or alkaline earth metal carbonate; and a **catalyst** comprising zirconium and at least one polyelectrolyte (emphasis added). See, e.g., column 2, lines 16-22.

A catalyst is known to one skilled in the art, and is defined in many textbooks, as a substance that by its mere presence alters the velocity of a reaction and it itself may be recovered unaltered and in the same amount at the end of the reaction. The Monick et al composition comprising zirconium as catalyst indicates that zirconium is not a reactant. That is, where a flocculant is present, zirconium cannot be and is not suggested for use as precipitant or flocculant.

It is now clear, the zirconium disclosed in Ayukawa combines with the contaminants to cause precipitation and flocculation. To the contrary, the zirconium described in Monick et al is a catalyst that by definition does not combine with contaminants causing precipitation and flocculation.

The disclosures of Monick et al and Ayukawa are, therefore, contradictory to each other and the references themselves suggest that these two references cannot be combined. That is, Monick et al does not suggest the teaching missing in Ayukawa - an organic polymer (claim 15) or combining an organic polymer and an inorganic colloid (claim 22) to remove phosphorus. Even if they could arguably be combined, the combined disclosure does not suggest the synergism discussed above.

B. Ayukawa Teaches Away from the Invention

A question that should be also raised is whether Ayukawa teaches one skilled in the art away from claims 15-16, 19, 22-24, and 34 that specifically call for addition of an organic polymer to a stream that has already formed or must form precipitates or chelates upon the addition of Zr ions as taught in Ayukawa. One skilled in the art would readily agree that Ayukawa teaches away from claims 15-16, 19, 22-24, and 34.

If Ayukawa provides motivation to derive the claimed invention, as the examiner asserted, the inorganic colloid and non-colloidal material (such as, for example, metal phosphates in fertilizer) recited in the claimed invention are or should be precipitated by Zr or Ti metal ions (because Ayukawa discloses precipitating colloids with metal ions) rendering the organic polymer (claim 15) and inorganic colloid (claim 23) functionless or useless. Addition of metal ions, organic polymer (claim 15) and inorganic colloid (claim 23) to a wastewater therefore does not make sense, in view of Ayukawa disclosure.

That is, no reasonable person would, in view of Ayukawa disclosure, combine Zr metal ions, organic polymer (claim 15) and inorganic colloid (claim 23) together. Ayukawa therefore leads one skilled in the art away from the claimed invention.

C. The Invention Shows Surprising Results

It is noted that Ayukawa disclosure not only precipitates or chelates low molecular weight non-colloidal substance, but also precipitates or chelates colloidal dispersed particles. See column 1, line 64 to column 2, line 2; column 2, lines 8-14;

et seq. Ayukawa would lead one skilled in the art to believe that an organic polymer and/or inorganic colloid is irrelevant.

The Board is respectfully directed to the present application at pages 20 and 21 where the application shows that, without the addition of Ti (Table 9; page 20) or Zr (Table 10; page 21) ions, addition of anionic colloid (SiO_2) and cationic polyacrylamide (flocculant) reduced little (Table 10) or less than 50% (Table 9) of phosphorus present in the wastewater.

The declaration referred to above further shows that merely adjusting pH with an acid followed by addition of Ti or Zr did not appreciably reduce the P concentration or COD (see runs 4-5 and 7-8). Further addition of an anionic colloid and/or an organic polymer following the pH adjustment (runs 6 and 9) as recited in the claimed invention significantly reduced the P concentration and COD.

These results demonstrate a synergistic effect of combining pH adjustment, Zr or Ti metal ions, and an inorganic colloid and/or polymer.

Ayukawa disclosure does not suggest the synergism. The question is whether Monick et al suggests such synergism.

Monick et al, the above discussion of which is incorporated here, does not suggest, as discussed above, that an organic polymer (claim 15) or combining an organic polymer and an inorganic colloid (claim 22) is needed to remove phosphorus.

In fact, by disclosing zirconium as a catalyst, Monick et al does not even suggest that zirconium can be a precipitant for precipitating phosphorus. It is apparent that Monick et al does not suggest the synergism demonstrated in the application.

Furthermore, Monick et al (column 7, line 54-56) discloses

After a sufficiently long enough time to mix the composition and wastewater together, usually about 10 to 20 minutes, a floc *begins to form* in the tank 11 (*italics appellant's*).

The Board is again respectfully directed to the declaration (paper 5) appellant submitted. For example, in run 9 (page 2 of the declaration) where the final chemical (APAM) was added at 60 seconds followed by mixing for 15 seconds (time scale 75

seconds) and then slower mixing for an additional 45 seconds for a total mix time of 60 seconds (time scale 120 seconds) after the final chemical addition.

Although at this point the mass was well flocculated, another 120 seconds were allowed for the flocculated mass to settle in order to separate it from the clarified water before sampling such that the clarified water was more representative. The control runs were carried out the same way.

Monick et al discloses that a floc only *begins to form* after 10 or 20 minutes. This "10 to 20 minutes" period is at least 10 times longer than that shown in appellant's declaration. Apparently Monick et al does not suggest the synergism shown in the present invention.

Because Ayukawa and Monick et al do not suggest the synergism, the claimed invention is patentably distinct from the combined references.

D. Claim 34

Claim 34 further distinguishes over the references by excluding the steps and materials disclosed in the references that have material and novel effect on the characteristics of the claims.

Accordingly, appellant submits that the examiner erred in rejecting claims 15-16, 19, 22-24, and 34 under 35 USC 103(a) over Ayukawa and Monick et al.

4. Whether the Examiner erred in Rejecting Claims 17-18, 20-22, and 35-40 under 35 USC 103(a) over Ayukawa, Monick et al, and Laurent et al.

Claims 17-18, 20-22, and 35-40 are dependent from claim 15. Claim 15, as discussed above, patentably distinct from Ayukawa and Monick et al as discussed in issue 3. The questions are whether Laurent et al suggests the teaching missing in Ayukawa and Monick et al, assuming they can be combined, and whether Laurent et al suggests the unexpected synergism of employing (1) Ti ions, Zr ions, or both and (2) an organic polymer.

Briefly, Laurent et al discloses, as discussed above, recovery of contaminants from waste streams using natural flocculent and use the recovered flocculated waste for animal feed. Appellant sees no disclosure or suggestion in Laurent et al that (1)

Ti ions, Zr ions, or both and (2) an organic polymer must be used together to obtain satisfactory results. Nor does appellant see, in Monick et al, the suggestion of synergistic effect discussed above.

Accordingly, whether Laurent et al discloses the use of recovered waste is immaterial to the claimed invention because it does not suggest the teaching missing in Ayukawa and Monick et al, i.e., no *prima facie* case of obviousness is established.

Claims 35-40 further distinguish over the references by excluding the steps and materials disclosed in the references that have material and novel effect on the characteristics of the claims.

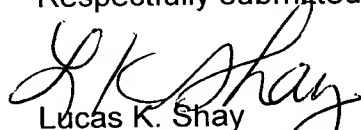
As such, the examiner erred in rejecting claims 17-18, 20-22, and 35-40 under 35 USC 103(a) over Ayukawa, Monick et al, and Laurent et al.

CONCLUSION

For the reasons stated, appellant respectfully submits that the examiner is incorrect in rejecting (1) claims 1, 3-5, 7-14, and 23-24 under 35 USC §103(a) over Allgulin and Chung et al; (2) claims 2-4, 6-14, and 25-33 under 35 USC §103(a) over Allgulin, Chung et al, and Laurent et al; (3) claims 15-16, 19, 22-24, and 34 under 35 USC 103(a) over Ayukawa and Monick et al; and (4) claims 17-18, 20-22, and 35-40 under 35 USC 103(a) over Ayukawa, Monick et al, and Laurent et al.

Appellant, therefore, respectfully requests that the rejections be reversed.

Respectfully submitted,



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APPENDIX

1. A process to remove phosphorus from an aqueous stream, which comprises phosphorus, comprising: (a) adjusting pH of the stream to a pH of at least 7 by adding a calcium-containing compound; (b) adding one or more metal ions selected from the group consisting of zinc and manganese ions to the stream wherein the metal ion is present in the range of from about 0.01 to about 10,000 ppm, based on weight of the stream; (c) adding an anionic inorganic colloid to the stream; and (d) adding an organic polymer at about 0.01 to about 10,000 ppm, based on weight of the stream, to produce a flocculated mass.
2. The process of claim 1 wherein the aqueous stream is derived from food processing and the process further comprises recovering the flocculated mass and using the recovered flocculated mass as a nutrient source.
3. The process of claim 1 or 2 wherein the pH of the stream is adjusted to at least 10.
4. The process of claim 3 further comprising lowering the pH to 7 to 9.
5. A process to remove phosphorus from an aqueous stream, which comprises phosphorus, comprising (a) adjusting pH of the stream to a pH of at least 7 by adding a calcium containing compound; (b) adding one or more metal ions selected from the group consisting of zinc ions and manganese ions to the stream wherein the metal ion is present in the range of from about 0.01 to about 10,000 ppm, based on weight of the stream; (c) adding at least one cationic organic polymer to the stream; and (d) adding at least one anionic organic polymer to the stream to produce a flocculated mass.
6. The process of claim 5 wherein the aqueous stream is derived from food processing and the process further comprises recovering the flocculated mass and using the recovered flocculated mass as a nutrient source.
7. The process of claim 5 or 6 wherein the cationic polymer is cationic polyacrylamide and wherein the anionic polymer is anionic polyacrylamide.
8. The process of claim 5 or 6 wherein the pH of the stream is adjusted to at least 10.

9. The process of claim 7 wherein the pH of the stream is adjusted to at least 10.
10. The process of claim 5 or 6 further comprising lowering the pH to 7 to 9.
11. The process of claim 7 further comprising adding to the stream an anionic inorganic colloid.
12. The process of claim 8 further comprising adding to the stream an anionic inorganic colloid.
13. The process of claim 9 further comprising adding to the stream an anionic inorganic colloid.
14. The process of claim 10 further comprising adding to the stream an anionic inorganic colloid.
15. A process to remove phosphorus from an aqueous stream, which comprises phosphorus, comprising (a) adding one or more metal ions selected from the group consisting of titanium and zirconium to the stream; and (b) adding an organic polymer at about 0.01 to about 10,000 ppm, based on weight of the stream, to the stream to produce a flocculated mass.
16. The process of claim 15 further comprising adjusting the pH of the stream to 7 or lower.
17. The process of claim 15 wherein the aqueous stream is derived from food processing further comprising recovering the flocculated mass and using the recovered flocculated mass as a nutrient source.
18. The process of claim 16 further comprising recovering the flocculated mass and using the recovered flocculated mass as a nutrient source.
19. The process of claim 16 wherein said pH is 3 to 5.
20. The process of claim 17 wherein said pH is 3 to 5.
21. The process of claim 18 wherein said pH is 3 to 5.
22. The process of claim 19, 20, or 21 further comprising adding to the stream an anionic inorganic colloid.

23. The process of claim 1 or 15 wherein the flocculant is an anionic organic polymer.

24. The process according to claim 1 or 15 further comprising separating the flocculated mass from the stream.

25. A process consisting essentially of adjusting the pH of an aqueous stream, which comprises phosphorus, to at least 7 by adding a calcium-containing compound; adding one or more metal ions selected from the group consisting of zinc ions, manganese ions, and mixtures thereof to the stream wherein the metal ion is present in the range of from about 0.01 to about 10,000 ppm, based on weight of the stream;

- (a) adding an anionic inorganic colloid and an organic polymer at about 0.01 to about 10,000 ppm, based on weight of the stream to produce a flocculated mass; or
- (b) adding at least one cationic organic polymer and at least one anionic organic polymer to the stream to produce a flocculated mass; or
- (c) adding an organic polymer at about 0.01 to about 10,000 ppm, based on weight of the stream, to produce a flocculated mass; and recovering the flocculated mass; and using the recovered the flocculated mass as a nutrient source.

26. The process of claim 25 wherein said process consists essentially of adjusting the pH of an aqueous stream, which comprises phosphorus, to at least 7 by adding a calcium-containing compound; adding one or more metal ions selected from the group consisting of zinc ions, manganese ions, and mixtures thereof to the stream; and adding an anionic inorganic colloid to the stream; and adding a flocculant to produce a flocculated mass.

27. The process of claim 25 wherein said process consists essentially of adjusting the pH of an aqueous stream, which comprises phosphorus, to at least 7 by adding a calcium-containing compound; adding one or more metal ions selected from the group consisting of zinc ions, manganese ions, and mixtures thereof to the stream; adding at least one cationic organic polymer to the stream; and adding at least one anionic organic polymer to the stream to produce a flocculated mass.

28. The process of claim 25 wherein said process consists essentially of adjusting the pH of an aqueous stream, which comprises phosphorus, to at least 7 by adding a calcium-containing compound; adding one or more metal ions selected from the group consisting of zinc ions, manganese ions, and mixtures thereof to the stream; adding a flocculant to the stream to produce a flocculated mass; recovering the flocculated mass; and using the recovered the flocculated mass as a nutrient source or animal feed.

29. The claim of 25, 26, 27, or 28 wherein the pH of the stream is adjusted to at least pH 10.

30. The claim of 25, 26, 27, or 28 wherein the pH of the stream is adjusted to at least 10 and is subsequently lowered to 7 to 9.

31. The process of claim 27 wherein said process consists essentially of adjusting the pH of an aqueous stream, which comprises phosphorus, to at least 7 by adding a calcium-containing compound; adding one or more metal ions selected from the group consisting of zinc ions, manganese ions, and mixtures thereof to the stream; adding at least one cationic organic polymer to the stream; adding an anionic inorganic colloid to the stream; and adding at least one anionic organic polymer to the stream to produce a flocculated mass.

32. The process of claim 28 wherein said process consists essentially of adjusting the pH of an aqueous stream, which comprises phosphorus, to at least 7 by adding a calcium-containing compound; adding one or more metal ions selected from the group consisting of zinc ions, manganese ions, and mixtures thereof to the stream; adding an anionic inorganic colloid to the stream; adding a cationic organic polymer to the stream to produce a flocculated mass; recovering the flocculated mass; and using the recovered the flocculated mass as a nutrient source or animal feed.

33. The process of claim 27 wherein the cationic polymer is cationic polyacrylamide and wherein the anionic polymer is anionic polyacrylamide.

34. A process to remove phosphorus from an aqueous stream, which comprises phosphorus, consisting essentially of adding one or more metal ions selected from the group consisting of titanium and zirconium, and a cationic organic

polymer to the stream to the stream to produce a flocculated mass wherein the metal ion and said organic polymer is each present in the range of from about 1 to about 2,500 ppm, based on weight of the stream.

35. The process of claim 34 consisting essentially of adjusting the pH of the stream to 7 or lower, and adding one or more metal ions selected from the group consisting of titanium and zirconium and a flocculant to the stream to the stream to produce a flocculated mass; or adjusting the pH of the stream to 7 or lower, adding one or more metal ions selected from the group consisting of titanium and zirconium ions, a flocculant to produce a flocculated mass, recovering the flocculated mass, and using the recovered flocculated mass as a nutrient source.

36. The process of claim 35 consisting essentially of adjusting the pH of the stream to 7 or lower; and adding one or more metal ions selected from the group consisting of titanium and zirconium, and a flocculant to the stream to the stream to produce a flocculated mass.

37. The process of claim 35 consisting essentially of adjusting the pH of the stream to 7 or lower; and adding one or more metal ions selected from the group consisting of titanium and zirconium, and a flocculant to produce a flocculated mass; recovering the flocculated mass; and using the recovered flocculated mass as a nutrient source wherein the aqueous stream is derived from food processing and the process.

38. The process of claim 35 consisting essentially of adjusting the pH of the stream to 7 or lower; and adding one or more metal ions selected from the group consisting of titanium and zirconium, an anionic inorganic colloid, and a flocculant to the stream to the stream to produce a flocculated mass.

39. The process of claim 34 consisting essentially of adjusting the pH of the stream to 7 or lower; adding one or more metal ions selected from the group consisting of titanium ions and zirconium ions, an anionic inorganic colloid, and a flocculant to produce a flocculated mass; recovering the flocculated mass; and using the recovered flocculated mass as a nutrient source wherein the aqueous stream is derived from food processing.

40. The process of 36, 37, 38, or 39 wherein the pH is adjusted to 3-5, inclusive.